

## **Central Region Science Priority – Invasives**

### **Issues/Problems**

More than 6,500 non-native species are now established in the United States, posing risks to native species, ecosystems, human and wildlife health, and the U.S. economy.

Hundreds of species, first introduced either accidentally or intentionally years ago, have become invasive and are now causing widespread damage. In the Central Region, these widespread invaders include zebra mussels; tamarisk and Russian olive in riparian areas; thistles, knapweeds, leafy spurge, and cheat grass. In addition, a growing number of aggressive new invaders, such as Asian carp and cactus moth, threaten native species and could disrupt ecosystems over large regions if they become widely established. The increasing threat of new invasions intensifies the need for scientists, managers, and the many stakeholders affected by invasive species to rally together to build better systems to prevent new introductions, enhance early detection and rapid response to new invaders, development of innovative methods for tracking, controlling and the impact of various land management practices on control or spread of invasives, and -- if possible -- eradicating established invaders, and restoring habitats damaged by invaders.

### **Stakeholders**

Threats from invasive species to ecosystems and economic uses are recognized as a priority concern of DOI management bureaus and other Federal and Tribal agencies with responsibilities for managing or controlling invasive species. These agencies will be partners with USGS in early detection and monitoring, and primary users of USGS research products. Many States have established or are currently establishing interagency and multi-sector committees to coordinate their efforts to address the growing threats of invasive species. These committees will develop state perspectives on information needs, facilitate partnerships (e.g., in development of early warning and monitoring), and could be clients for USGS products. USGS scientists have developed strong alliances, collaboration, and cooperative programs with State, Tribal, and Local resource management agencies and entities. Communication and collaboration with these stakeholders could be enhanced by local facilitation in matters related to identification of areas where invasives have become a problem or where control measures have been planned or implemented. There have been several invasive focused workshops, and the Central Region sponsored a Tamarisk workshop in Albuquerque, NM, on August 27-28, 2003 (<http://biology.usgs.gov/cro/Tamarisk/Tamariskindex.htm>). The DOI is sponsoring a stakeholder, multi-agency Tamarisk workshop also in Albuquerque, NM, on March 31-April 2, 2004 (<http://www.werc.net/tamarisk/>).

### **Opportunities for Integration**

The USGS is uniquely positioned to provide long-term integrated research on invasive species in support of resources management on DOI and adjacent lands. We have strong capabilities for interdisciplinary science linking high-resolution remote sensing and ecosystem mapping, integrated landscape ecology and species biology, hydrology, and information science. Because biological invasions are both a cause and a result of environmental changes, understanding and predicting invasions requires information on the complex factor interactions that influence these changes. Invasive species are therefore a cross-cutting issue that provides opportunities for integration of the capabilities of many USGS programs (see Table 1).

### **USGS Program Goals**

The USGS Invasives Program activities focus on developing information, methodologies, and tools in each of the following areas: (1) Understanding and predicting pathways for the introduction and spread of invasive species; (2) Identifying and reporting new invasions and assessing their environmental risks; (3) Monitoring populations and distributions of established invasive species; (4) Determining the effects of invasive species and the susceptibility of habitats to invasions; and (5) Providing approaches to control or eliminate populations of invasive species and restore natural habitats and native species. The efforts include development of methods for monitoring the effectiveness of control and restoration treatments to facilitate adaptive management (See Attachment 1 for Goals). Invasives is one of the six science themes identified at the Regional Executive and Program Coordinator meeting in October 2003, and is also one of the Director's Future Science Directions.

### **Strategy**

Executive Order 13112 (Invasive Species) sets forth Federal agency responsibilities for combating invasive species and established the interagency National Invasive Species Council (NISC) to oversee the implementation of the Order and an Invasive Species Advisory Committee (ISAC) to facilitate involvement of other levels of government and public interests. The Order directed the Council to develop an internet-based information-sharing system and prepare a National Invasive Species Management Plan, approved in 2001, which identifies nine focus areas and 57 near-term actions for Federal agency implementation. The USGS has been successful in being recognized and funded under this Departmental effort to provide the science and information needed to make sound management decisions on invasives. The regional strategy should continue to focus on the highest priority issues, such as tamarisk, Asian carp, and other emerging invaders.

### **Next Steps**

Some areas of particular opportunity for integrated science in CR for which new or redirected funding is likely to be available over the next several years:

- Mapping of current distribution and abundance of tamarisk
- Integrated ecological and hydrological research to support accurate forecasting of tamarisk impacts on ground water and wildlife
- Incorporate geomorphological research in defining ecosystems in riparian environments
- Investigate linkages between invasive species and natural resource extraction

- Modeling the probable spread and impacts of priority invaders in large river ecosystems to support development of innovative control strategies -- Asian carp
- Integration of ecological, hydrological, and socioeconomic models in multi-scale forecasting of probable impacts of priority taxa of invasive species (with NASA).
- Rapid assessments of new invaders in U.S. ecosystems (national capability coordinated through the National Institute of Invasive Species Science (NIISS) to facilitate rapid response actions)
- Although assessing the status and trends of invasive plant species has not been an objective of NAWQA to date, the Program has numerous records of invasive macroinvertebrates (e.g. snails) and fish (e.g. Asian carp; other non-native fish species) in a central database.
- Hydrologic technicians could document the occurrence and relative abundance of invasive plants along stream reaches when gaging stations are visited for routine maintenance and calibration. This could provide a temporal record of relative growth rates of invasive species and associated antecedent streamflow conditions.
- As part of EPA's EMAP during the past several years, qualitative information on invasive plant species has been collected at more than 250 small stream reaches throughout the northern part of the Central Region. These data could be mined to provide a current perspective on the distribution of invasives and the potential for downstream migration to larger streams and rivers.

## **Budget Cycle Objectives**

### **FY2004**

- In FY 2004, NISC prepared the first annual interagency cross-cut budget, which identifies priority interagency initiatives, desired outcomes, and performance measures. USGS scientists played important roles in most of the ad-hoc work groups established by NISC to formulate FY 2004 and 2005 cross-cut budgets for priority initiatives. In FY 2004, these efforts resulted in increased funding for research involving CR on salt cedar in the Southwest, nutria in Louisiana, and initial development of a national early detection system, through cooperation of the NIISS (<http://kiowa.colostate.edu/cwis438/niiss/index.html>) and NBII's Invasive Species Information Node (<http://invasivespecies.nbii.gov/>).
- Plan an all-DOI Workshop on invasive species through the NIISS
  - Increase USGS awareness of DOI bureau needs and priorities
  - Enhance partner appreciation and use of USGS information, methods and tools for prevention, detection, monitoring, risk assessment, and eradication/control, including restoration of ecosystem functions and native species
  - Enhance the effectiveness of USGS research, information, and technical assistance in assisting DOI bureaus to develop more effective responses to invasive species
- Consider the issues of invasives in Regional-funded programs (CRISP, DOI Landscapes)
- Science Associates and others continue to look for programmatic and multidiscipline opportunities in invasive species science activities.

**FY2005**

- In FY2005, the administration's budget will include support for increased CR research on the brown tree snake and aquatic invaders – including Asian carp in the Mississippi River system.

**FY2006**

- For FY 2006, a budget initiative has been requested by the Director to be submitted for consideration by the DOI. When available, a copy will be distributed and attached to this priority.

### Performance Metric Chart

Performance Measures	Planned Activities	Timeframe
Increase awareness of bureau needs and priorities, appreciation and use of USGS research, information, and technical assistance in assisting DOI bureaus to develop more effective responses to invasive species	Conduct a DOI-Wide Invasives Workshop FY04-05	September-November
Increase USGS Invasive Species Program funding for research in the CR	Develop FY06 Budget initiative	March
Increase Regional support for invasives activities and issues to encourage collaborative integrated science	Provide regional CRISP or DOI funds to support an integrated invasives initiative	Ongoing
Increase Regional and National recognition for the National Institute of Invasive Species Science (NIISS)	Support the NIISS, including the Invasive Species Node, in facilitating cooperation among USGS disciplines and programs, and between USGS and outside entities in providing information, methods, and tools for combating the introduction and spread of invasive species.	Ongoing
Develop information packages on Invasives and other regional Priorities	Coordinate with the Regional Communications Office to develop fact sheets, posters, and other materials	March
Explore opportunities for additional funding outside of USGS	Use forums such as BLM State Directors and Science Coordinators meetings to discuss invasive species issues	Ongoing
Plan for FY05 science activities in the CR	Expand on PC-REX meeting outcome, and charge Science Associates to work closely with Program Coordinators to explore collaborative opportunities	March

**Table 1**  
**USGS Programs**

<b>Discipline/Program</b>		<b>Contributions to Invasive Species Research</b>
<b>Biology</b>	Invasives	Program Coordination and Direction
	Biological Informatics	Information standards and management, taxonomic information, internet technologies
	Contaminants	Effects of contaminants on invasion processes, effects of invaders on accumulation and cycling
	Cooperative Fish and Wildlife Research	Outreach to state natural resource agencies; access to university research capabilities
	Ecosystems	Effects of multi-factor interactions on ecosystem processes; including fire and climate change
	Fisheries and Aquatic Resources	Effects of invasions on native aquatic biota, including special status species
	Status and Trends	Monitoring and assessment methods for all levels of biological diversity and trends
	Wildlife and Terrestrial Resources	Effects of invasions on native terrestrial biota, including special status species
<b>Geography</b>	Land and Remote Sensing; GAM	Applications of remote sensing technologies in monitoring; GIS applications, modeling
<b>Geology</b>	Coastal and Marine	Effects of coastal processes on invasions
	Earth Surface Dynamics	Modeling and forecasting disturbances influencing invasion processes
	National Cooperative Geologic Mapping	Geological data for ecosystem mapping, modeling and forecasting invasions
<b>Water Resources</b>	Ground Water Resources	Hydrological data for modeling and forecasting invasions, especially in wetlands and riparian areas
	Surface Water Resources	Hydrological data for modeling and forecasting invasions, especially in wetlands and riparian areas
	Hydrological Research and Development	Effects of interacting hydrological factors influencing invader establishment and spread
	National Water Quality Assessment	Data on water quality conditions and trends for use in modeling and forecasting invasions

## **Attachment 1**

### **USGS Invasives Species Program Goals**

Definitions (from Executive Order 13112, Invasive Species (February 3, 1999):

*“Invasive species” means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health*

*“Alien species” means, with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating the species, that is not native to that ecosystem.*

The draft-five year plan includes six long-term program goals and the kinds of activities that will be conducted to achieve them:

**1. PREVENTION:** *Conduct research and develop methods and technologies to prevent the introduction invasive species.*

- Development of methodologies and approaches for identification, quantification, monitoring, and managing pathways and associated vectors of transport.
- Research on interacting environmental processes, socioeconomic factors, and human behaviors that influence the contributions of various pathways and vectors to the introduction and spread of known or potentially invasive species.

**2. EARLY DETECTION AND RAPID RESPONSE:** *Identify and report new invasions and assess risks to natural areas and waters.*

- Improved taxonomic identification, field surveys, and the design of reporting networks.
- Synthesis of available information on the distribution and ecology of species in their native and invaded ranges
- Geographic information system technologies and predictive modeling to help predict potential establishment, spread, probable risks of species new to the U.S. and outbreaks of established invasions in new ecological regions, and the need to management action.

**3. MONITORING AND FORECASTING:** *Assess changes in populations and distributions of established invaders*

- Cost effective methodologies for statistically reliable monitoring of the spread of invasive species in forests, grasslands, arid lands, wetlands, and other major U.S. ecosystems.
- Integrated use of historical occurrence records, remote sensing and GPS technologies, improved field sampling methods, and geographic information systems to document spatial and temporal patterns of expanding invasions at site, landscape, and regional scales.

- Improved methods for documenting the state and trends in invader populations in support of efforts to understand factors influencing the lag period – sometimes spanning many decades – between the initial establishment of a free living population and the appearance of invasions at the landscape and regional scales.

**4. EFFECTS:** *Determine effects of invasive species and susceptibility of habitats to invasion*

- Research on the genetics, physiology, population dynamics, and ecology of invasive species to determine factors influencing invasiveness,
- Research on the individual and cumulative effects of invasive species on ecosystem processes and native species

**5. CONTROL AND MANAGEMENT:** *Provide approaches to contain, reduce, and eliminate populations of invasive species and restore habitats and native species.*

- Development and testing of approaches to contain, control,, and, where possible, eradicate populations of invasive species established in U.S. habitats . Emphasis on genetic, biological, and ecological methods that reduce impacts of invasive species at landscape and regional scales, and that help restore ecosystem processes and populations of native species, especially those that are endemic or threatened.

**6. INFORMATION MANAGEMENT:** *Provide and coordinate the collection, synthesis, accessibility and usability of invasive species information.*

- Development of a distributive and integrated web-based electronic information system that facilitates "one-stop shopping" for data and information on the taxonomy, native and introduced ranges, ecology, and impacts of invasive species
- Dissemination of interactive tools for forecasting, risk assessment, and decision support
- Applications of Internet technologies
- Development and updating of Program website